REMARKS/ARGUMENTS

Claims 1-8, 10-18, and 20-94 were pending in this application and examined. Claims 1-67 have been cancelled without prejudice. Claims 68 and 91 have been amended. Claims 68-94 remain pending in this application after entry of this amendment. No new matter has been added.

TERMINAL DISCLAIMER

A terminal disclaimer was previously submitted for this application (filed with the response filed on 04/29/05) to overcome a provisional double patenting rejection with respect to U.S. Application No. 09/264,547. Applicant however believes that the terminal disclaimer may not have been in the appropriate format to overcome a provisional double patenting rejection. Accordingly, a terminal disclaimer for U.S. Application No. 09/264,547 in the appropriate form is being resubmitted with this amendment.

THE CLAIMS

Rejections under 35 U.S.C. 103(a)

Claim 1-67

Claims 1-67 have been canceled without prejudice. Applicant reserves the right to prosecute the canceled claims in continuing applications.

Claim 68- 90

Claims 68-90 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wu et al. (USP-5,338,198) (hereinafter "Wu") and further in view of Yoon and Andreiko et al. (USP-5,395,238) (hereinafter "Andreiko"). Applicant respectfully traverses the rejections.

Applicant submits that at least the features of

(b) applying a computer-implemented test to the 3D data set to identify data elements that represent an interproximal margin between two teeth in the dentition, wherein applying the computer-implemented test includes;

identifying elements of the data set that represent the interproximal margin, and

labeling those data elements as belonging to the interproximal margin; and

(c) applying another computer-implemented test to select data elements that lie on one side of the interproximal margin for inclusion in the digital model of the tooth. (Applicant's claim 68)

are not taught by Wu, Yoon, or Andreiko, considered individually or in combination.

Wu describes techniques for preparing a three-dimensional model of the teeth of a patient by taking molded impressions of the mandibular and maxillar teeth, placing separately the impressions on a support table define an X-Y plane and detecting the Z distance from a probe by directing a beam of laser light onto the impression and calculating from the pattern of reflected light a centre of the light falling on an area array. Wu does not appear to teach anything about applying a test to a 3D data set of a dentition to determine elements that represent an interproximal margin between two teeth in the dentition. While Wu generally mentions software that allows for customized model segmentation (Wu: col. 7 lines 7-10) and processing of images (Wu: col. 8 lines 6-15), there is however no teaching that the processing includes determining an interproximal margin from a 3D data set and using the interproximal margin data elements to determine data elements for inclusion in the digital model of the tooth, as recited in claim 68. Accordingly, Applicant submits that step (b) recited in claim 68 is not taught or suggested by Wu. Consequently, Applicant submits that step (c) recited in claim 68, which uses the interproximal margin determined in (b), is also not taught or suggested by Wu.

Further, the deficiencies of Wu are not cured by Yoon. Yoon teaches a caries detection system and method for quantifying a probability of lesions existing in tissues. Digital X-ray images are segmented and further processed to generate feature statistics inputs for a neural network. The feature statistics include colinearity

measurements of candidate lesions in different tissue segments. The neural network is trained by back propagation with an extensive data set of radiographs and histologic examinations and processes the statistics to determine the probability of lesions existing in the tissues.

Applicant submits that, like Wu, Yoon does not teach anything about applying a computer-implemented test to the 3D data set to identify data elements that represent an interproximal margin between two teeth in the dentition. Firstly, Yoon does not deal with a 3-dimensional data set representing a dentition, as recited in claim 68 -- instead the processing in Yoon uses 2-dimensional X-ray images (Yoon: col. 3 lines .20-21). The 2-d X ray images are then processed according to the flowchart depicted in Figs. 3A, 3B, 3C, and 3D of Yoon.

Further, there appears to be no teaching in Yoon of identifying elements that represent an interproximal margin between two teeth in the dentition. The flowcharts depicted in Figs. 3A-3D of Yoon and the associated description describe an automatic image segmentation technique. Yoon states that different sets of segmentation parameters may be used in the segmentation algorithm (Yoon: col. 4 lines 10-20). However, there appears to be no teaching in Yoon that the technique identifies elements that represent an interproximal margin between two teeth in the dentition, labels those data elements as belonging to the interproximal margin, and selects data elements that lie on one side of the interproximal margin for inclusion in the digital model of the tooth, as recited in claim 68. On the contrary Yoon uses a gradient method to identify the outer boundaries of teeth (Yoon: col. 4 lines 12-14) -- this is substantially different from the method recited in claim 68.

In light of the above, Applicant submits that, like Wu, Yoon fails to teach features (b) and (c) recited in claim 68. Accordingly, even if Wu and Yoon are combined as suggested by the Office Action (even though it is not clear if there is any motivation for the combination), the resultant combination would fail to teach the features of claim 68.

Further, Applicant submits that the deficiencies of Wu and Yoon are not cured by Andreiko. Andreiko describes a method of forming an orthodontic brace from a plurality of brackets and an unbent arch wire such that the proper forces are applied by the brace to a patient's teeth to move the patient's teeth into a desired configuration. In Andreiko, parameters individual to a patient's tooth are determined and processed to form slots in brackets and position the brackets on the patient's teeth such that an arch wire disposed in the slots in the brackets will have a planar configuration in an elevational view and a progressively curved configuration in a planar view. In Andreiko, contours of a patient's teeth are digitally determined from individual teeth of a model of the patient's mouth provided by an orthodontist, preferably by scanning individual teeth in a lingual-facial plane on the model with a mechanical probe. Tooth parameters include tooth-gum intersections, mesial cusp tips or lingual and facial incisal edge points, and groove/ridge locations are selected on the contours. (Andreiko: Abstract, col. 1 lines 9-20).

Accordingly, Andreiko teaches determining various parameters associated with individual teeth. However, all the parameters in Andreiko appear to be associated with an individual tooth (Andreiko: col. 5 lines 12-14), not interproximal margins. Andreiko thus does not appear to teach determining an interproximal margin from the dentition, as recited in claim 68.

As further recited in claim 68, data elements representing the interproximal margin are first identified and then used to determine data elements to be included in a digital model for a tooth, as recited in claim 68. Applicant submits that this is also not taught by Andreiko. In Andreiko, the contours for individual teeth are determined from a model of the patient's mouth. Parameters for each tooth are then determined. Accordingly, in Andreiko, parameters are determined after an individual tooth has been determined. This is substantially different and opposite from claim 68. In claim 68, data elements representing an interproximal margin are first determined from the 3-dimensional data set representing the dentition and a digital model for a tooth is then determined based upon the interproximal margin data elements -- the interproximal

margin data elements are not determined from the tooth model. This further differentiates claim 68 from Andreiko.

In light of the above, Applicant submits that, like Wu and Yoon, Andreiko also fails to teach features (b) and (c) recited in claim 68. Accordingly, even if Wu, Yoon, and Andreiko are combined as suggested by the Office Action (even though it is not clear if there is any motivation for the combination), the resultant combination would fail to teach the features of claim 68.

In light of the above, Applicant submits that claim 68 is patentable over Wu, Yoon, and Andreiko, considered individually or in combination.

Applicant submits that dependent claims 69-90 that depend from claim 68 are also patentable for at least a similar rationale as discussed for the patentability of claim 68, and others. The dependent claims also recite additional features that make the claims patentable for additional reasons.

Claim 91-94

Claims 91-94 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wu in view of Yoon and further in view of Andreiko.

Applicant submits that at least the features recited in claim 91 of

(b) applying a test to the 3D dataset to identify data elements lying on a gingival boundary that occurs where the tooth and the gum tissue meet, wherein applying the computer-implemented test includes;

identifying elements of the data set that represent the gingival boundary, and

labeling those data elements as belonging to the gingival boundary; and

(c) applying a test to the data elements lying on the boundary to identify other data elements representing portions of the tooth.

are not taught by Wu, Yoon, or Andreiko, considered individually or in combination.

As indicated in the Office Action, Wu and Yoon fail to teach using gingival regions to create a digital model of a tooth. The Office Action however contends that the use of gingival regions to find a component is taught by Andreiko.

Applicant respectfully submits that Andreiko does not teach such a concept as recited in claim 91.

As described above, in Andreiko, contours of a patient's teeth are digitally determined from individual teeth of a model of the patient's mouth provided by an orthodontist. Tooth parameters are determined for each tooth based upon the tooth contour. These tooth parameters include tooth-gum intersection parameters. However, Applicant submits determining tooth-gum intersection parameters is substantially different from identifying elements (not merely parameter values) of the 3D data set representing a gingival boundary, as recited in claim 91. In Andreiko, elements of the patient's mouth model that represent a gingival boundary are not identified.

Further, as recited in claim 91, a test is applied to the data elements lying on the boundary to identify other data elements representing portions of the tooth. The data elements identified as lying on the gingival boundary are thus used to identify other data elements representing portions of a tooth. This is also not taught by Andreiko. In Andreiko, a contour for an individual tooth is first determined from a model of the patient's mouth. Parameters related to a tooth are then determined. Accordingly, in Andreiko, the parameters, including the tooth-gum intersection parameter, are determined from the tooth contour. This is substantially different and opposite from claim 91 wherein the data elements representing a gingival boundary are first determined from the 3D data set of the dentition and the identified data elements lying on the boundary are then used to identify data elements representing portion of a tooth. This further differentiates claim 92 from Andreiko.

In light of the above, Applicant submits that, even if Wu, Yoon, and Andreiko are combined as suggested by the Office Action (even though it is not clear if there is any motivation for the combination), the resultant combination would fail to teach the features of claim 91.

In light of the above, Applicant submits that claim 91 is patentable over Wu, Yoon, and Andreiko, considered individually or in combination.

Applicant submits that dependent claims 92-94 that depend from claim 91 are also patentable for at least a similar rationale as discussed for the patentability of claim 91, and others. The dependent claims also recite additional features that make the claims patentable for additional reasons.

CONCLUSION

In view of the foregoing, Applicants believe all claims now pending in this Application are in condition for allowance and an action to that end is respectfully requested.

If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned at 650-326-2400.

Respectfully submitted,

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